

Clean Version of Pending Claims

ELECTRONIC ASSEMBLY COMPRISING SOLDERABLE THERMAL INTERFACE

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1. (Amended) An assembly comprising:

- a die having a surface;
- an adhesion layer coupled to the surface;
- a solder-wettable layer coupled to the adhesion layer;
- a lid; and
- a solderable thermally conductive element to couple the lid to the solder-wettable layer.

2. The assembly recited in claim 1 wherein the lid comprises material from the group consisting of copper and aluminum-silicon-carbide.

3. The assembly recited in claim 1 wherein the solderable thermally conductive element comprises material, including one or more alloys, from the group consisting of tin, bismuth, silver, indium, and lead.

4. The assembly recited in claim 1 wherein the lid comprises at least one metal or organic layer to which the thermally conductive element can be coupled.

5. The assembly recited in claim 4 wherein the at least one metal or organic layer comprises nickel or gold.

6. (Amended) The assembly recited in claim 1 and further comprising:

a diffusion layer between the adhesion layer and the solder-wettable layer.

7. (Amended) The assembly recited in claim 6 wherein the layers comprise material, including one or more alloys, from the group consisting of titanium, chromium, zirconium, nickel, vanadium, and gold.

8. (Amended) An integrated circuit package comprising:

a substrate;

a die positioned on a surface of the substrate, the die having a back surface;

an adhesion layer formed on the back surface;

a solder-wettable layer formed on the adhesion layer;

a lid positioned over the die; and

a solderable thermally conductive element coupling the solder-wettable layer and the lid.

9. The integrated circuit package recited in claim 8 wherein the lid comprises a support member coupled to the substrate.

10. The integrated circuit package recited in claim 8 wherein the lid comprises material from the group consisting of copper and aluminum-silicon-carbide.

11. The integrated circuit package recited in claim 8 wherein the lid comprises at least one metal or organic layer to which the thermally conductive element is coupled.

12. The integrated circuit package recited in claim 11 wherein the at least one metal or organic layer comprises nickel or gold.
13. The integrated circuit package recited in claim 8 wherein the solderable thermally conductive element comprises material, including one or more alloys, from the group consisting of tin, bismuth, silver, indium, and lead.
14. The integrated circuit package recited in claim 8 wherein the substrate is an organic substrate and wherein the die is coupled to the substrate through a land grid array.
15. (Amended) The integrated circuit package recited in claim 8 and further comprising:
a diffusion layer between the adhesion layer and the solder-wettable layer.
16. (Amended) The integrated circuit package recited in claim 15 wherein the layers comprise material, including one or more alloys, from the group consisting of titanium, chromium, zirconium, nickel, vanadium, and gold.
17. (Amended) An electronic assembly comprising:
at least one integrated circuit package comprising:
a substrate;
a die positioned on a surface of the substrate, the die having a back surface

an adhesion layer formed on the back surface;
a solder-wettable layer formed on the adhesion layer;
a lid positioned over the die; and
a solderable thermally conductive element coupling the solder-wettable layer and the lid.

18. The electronic assembly recited in claim 17 wherein the lid comprises a support member coupled to the substrate.

19. The electronic assembly recited in claim 17 wherein the solderable thermally conductive element comprises material, including one or more alloys, from the group consisting of tin, bismuth, silver, indium, and lead.

20. The electronic assembly recited in claim 17 wherein the substrate is an organic substrate and wherein the die is coupled to the substrate through a land grid array.

21. (Twice Amended) An electronic system comprising an electronic assembly having at least one integrated circuit package comprising:

a substrate;
a die positioned on a surface of the substrate, the die having a back surface;
an adhesion layer formed on the back surface;
a solder-wettable layer formed on the adhesion layer;
a lid positioned over the die; and
a solderable thermally conductive element coupling the solder-wettable layer and the lid.

22. The electronic system recited in claim 21 wherein the solderable thermally conductive element comprises material, including one or more alloys, from the group consisting of tin, bismuth, silver, indium, and lead.
23. The electronic system recited in claim 21 wherein the substrate is an organic substrate, wherein the die is coupled to the substrate through a land grid array, and wherein the lid comprises a support member coupled to the substrate.
31. The assembly recited in claim 1 wherein the solderable thermally conductive element has a liquidus temperature of 150 degrees Centigrade or less.
32. The assembly recited in claim 1 wherein the solderable thermally conductive element has a liquidus temperature of 140 degrees Centigrade or less.
33. The assembly recited in claim 1 wherein the solderable thermally conductive element has a liquidus temperature in the range of 138 to 157 degrees Centigrade.
34. The assembly recited in claim 1 wherein the adhesion layer comprises material, including one or more alloys, from the group consisting of titanium, chromium, zirconium, nickel, vanadium, and gold.
35. The assembly recited in claim 1 wherein the adhesion layer comprises titanium.
36. The assembly recited in claim 1 wherein the solder-wettable layer comprises material, including one or more alloys, from the group consisting of titanium, chromium, zirconium, nickel, vanadium, and gold.

37. The assembly recited in claim 1 wherein the solder-wettable layer comprises one of nickel and gold.
38. The assembly recited in claim 6 wherein the diffusion layer comprises material, including one or more alloys, from the group consisting of titanium, chromium, zirconium, nickel, vanadium, and gold.
39. The assembly recited in claim 6 wherein the diffusion layer comprises nickel-vanadium.
40. The integrated circuit package recited in claim 8 wherein the solderable thermally conductive element has a liquidus temperature in the range of 138 to 157 degrees Centigrade.
41. The electronic assembly recited in claim 17 and further comprising:
a diffusion layer between the adhesion layer and the solder-wettable layer.
42. The electronic assembly recited in claim 41 wherein the layers comprise material, including one or more alloys, from the group consisting of titanium, chromium, zirconium, nickel, vanadium, and gold.
43. The electronic system recited in claim 21 and further comprising:
a diffusion layer between the adhesion layer and the solder-wettable layer.
44. The electronic system recited in claim 43 wherein the layers comprise material, including one or more alloys, from the group consisting of titanium, chromium, zirconium, nickel, vanadium, and gold.

45. An assembly comprising:
a die having a surface;
an adhesion layer formed on the surface; and
a solder-wettable layer formed on the adhesion layer to receive a solderable thermally conductive element.
46. The assembly recited in claim 45 wherein the adhesion layer comprises material, including one or more alloys, from the group consisting of titanium, chromium, zirconium, nickel, vanadium, and gold.
47. The assembly recited in claim 45 wherein the adhesion layer comprises titanium.
48. The assembly recited in claim 45 wherein the solder-wettable layer comprises material, including one or more alloys, from the group consisting of titanium, chromium, zirconium, nickel, vanadium, and gold.
49. The assembly recited in claim 45 wherein the solder-wettable layer comprises one of nickel and gold.
50. The assembly recited in claim 45 wherein the solderable thermally conductive element comprises material, including one or more alloys, from the group consisting of tin, bismuth, silver, indium, and lead.
51. The assembly recited in claim 45 wherein the solderable thermally conductive element has a liquidus temperature in the range of 138 to 157 degrees Centigrade.

52. The assembly recited in claim 45 and further comprising:
a diffusion layer formed between the adhesion layer and the solder-wettable layer.
53. The assembly recited in claim 52 wherein the diffusion layer comprises material, including one or more alloys, from the group consisting of titanium, chromium, zirconium, nickel, vanadium, and gold.
54. The assembly recited in claim 52 wherein the diffusion layer comprises nickel-vanadium.
55. An assembly comprising:
a die having a surface;
an adhesion layer coupled to the surface;
a solder-wettable layer coupled to the adhesion layer;
a lid; and
a thermal interface of solder material to couple the lid to the solder-wettable layer.
56. The assembly recited in claim 55 wherein the solder material comprises material, including one or more alloys, from the group consisting of tin, bismuth, silver, indium, and lead.
57. The assembly recited in claim 55 wherein the solder material has a liquidus temperature of 150 degrees Centigrade or less.
58. The assembly recited in claim 55 wherein the solder material has a liquidus temperature of 140 degrees Centigrade or less.
59. The assembly recited in claim 55 wherein the solder material has a liquidus temperature in the range of 138 to 157 degrees Centigrade.